We Claim:

1. A 2000 series aluminum product alloy consisting essentially of in weight percent about 3.60 to 4.25 copper, about 1.00 to 1.60 magnesium, about 0.30 to 0.80 manganese, no greater than about 0.05 silicon, no greater than about 0.07 iron, no greater than about 0.06 titanium, no greater than about 0.002 beryllium, the remainder aluminum and incidental elements and impurities, wherein a T_{max} heat treatment is below the lowest incipient melting temperature for a given 2000 series alloy composition and the Cu_{target} is determined by the expression:

$$Cu_{target}=Cu_{eff} + 0.74(Mn - 0.2) + 2.28(Fe - 0.005)$$

wherein said alloy improves by a minimum of 5% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R=0.1 and RH is greater than 90%, and combinations thereof.

2. A 2000 series aluminum product alloy consisting essentially of a composition within the box of W, X, Y, and Z as defined in Fig. 5, wherein T_{max} for each composition corner point is W = 925°F, X = 933°F, Y = 917°F, and Z = 909°F, wherein Cu_{target} is defined by the following equation:

$$Cu_{target} = Cu_{eff} + 0.74(Mn - 0.2) + 2.28(Fe - 0.005).$$

3. The 2000 series aluminum alloy of claim 1 wherein the Cu_{target} composition is about 3.85 to about 4.05 weight percent and the Mg_{target} is about 1.25 to about 1.45 weight percent.

4. The 2000 series aluminum alloy of claim 1 wherein said minimum improves by 5.5%.

5. The 2000 series aluminum alloy of claim 1 wherein said minimum improves by 6%.

6. The 2000 series aluminum alloy of claim 1 wherein said minimum improves by 6.5%.

7. The 2000 series aluminum alloy of claim 1 wherein said minimum improves by 7%.

8. The 2000 series aluminum alloy of claim 1 wherein said minimum improves by 7.5%.

9. The 2000 series aluminum alloy of claim 1 wherein said alloy is a structural component in an aerospace product.

10. The 2000 series aluminum alloy of claim 1 wherein said alloy is a part of a lower wing.

11. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 5% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein $R = 0.1$ and RH is greater than 90%, and combinations thereof.

12. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 5.5% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R = 0.1 and RH is greater than 90%, and combinations thereof.

13. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 6% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R = 0.1 and RH is greater than 90%, and combinations thereof.

14. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 6.5% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R = 0.1 and RH is greater than 90%, and combinations thereof.

15. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 7% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R = 0.1 and RH is greater than 90%, and combinations thereof.

16. The 2000 series aluminum alloy of claim 2 wherein said alloy improves by a minimum of 7.5% compared to the average values of standard 2324-T39 alloy shown in Fig. 1 for the same properties selected from the group consisting of the plane strain fracture toughness, K_{Ic}, the plane stress fracture toughness, K_{app}, the stress intensity factor range, ΔK, at a fatigue crack growth rate of 10 μ-inch/cycle wherein R = 0.1 and RH is greater than 90%, and combinations thereof

17. The 2000 series aluminum alloy of claim 2 wherein said alloy is a structural component in an aerospace product.

18. The 2000 series aluminum alloy of claim 1 wherein said alloy is a part of a lower wing.

19. The 2000 series aluminum alloy of claim 2 wherein said T_{max} increases from about 1, 2, 3, 4, or 5° F when silicon is less than about 0.04 weight percent.

20. The 2000 series aluminum alloy of claim 2 wherein said T_{max} increases from about 1, 2, 3, 4, or 5° F when silicon is less than about 0.03 weight percent.

21. The 2000 series aluminum alloy of claim 1 wherein said alloy is in a T-39 temper.

22. The 2000 series aluminum alloy of claim 1 wherein said alloy is in a T-351 temper.

23. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 1.9 in.

24. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 4.9 ksi$\sqrt{}$in.

25. The 2000 series aluminum alloy of claim 1 wherein said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum of 0.65 ksi$\sqrt{}$in with R equal to 0.1 and RH greater than 90%.

26. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 2.0 ksi$\sqrt{}$in.

27. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 5.4 ksi$\sqrt{}$in.

28. The 2000 series aluminum alloy of claim 1 where in said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum of 0.71 ksi$\sqrt{}$in with R equal to 0.1 and RH greater than 90%.

29. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 2.2 ksi$\sqrt{}$in.

30. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 5.9 ksi$\sqrt{}$in.

31. The 2000 series aluminum alloy of claim 1 wherein said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum of 0.80 ksi$\sqrt{}$in n with R equal to 0.1 and RH greater than 90%.

32. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 2.4 ksi$\sqrt{\text{in}}$.

33. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 6.4 ksi$\sqrt{\text{in}}$.

34. The 2000 series aluminum alloy of claim 1 wherein said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum of 0.85 ksi$\sqrt{\text{in}}$ with R equal to 0.1 and RH greater than 90%.

35. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 2.6 ksi$\sqrt{\text{in}}$.

36. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 6.9 ksi$\sqrt{\text{in}}$.

37. The 2000 series aluminum alloy of claim 1 where in said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum of 0.90 ksi$\sqrt{\text{in}}$ with R equal to 0.1 and RH greater than 90%.

38. The 2000 series aluminum alloy of claim 1 wherein said K_{Ic} improves by a minimum of 2.8 ksi$\sqrt{\text{in}}$.

39. The 2000 series aluminum alloy of claim 1 wherein said K_{app} improves by a minimum of 7.4 ksi$\sqrt{\text{in}}$.

40. The 2000 series aluminum alloy of claim 1 wherein said ΔK at a fatigue crack growth rate of 10 μ-inch/cycle improves by a minimum 1.00 ksi$\sqrt{\text{in}}$ with R equal to 0.1 and RH greater than 90%.